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BOATS AND ASSOCIATED EQUIPMENT

Proposed Safety Standards for Boat Gasoline Fuel Systems

DEPARTMENT OF TRANSPORTATION

Coast Guard

[33 CFR Part 183]

[CGD 74-209]

BOATS AND ASSOCIATED EQUIPMENT

Proposed Safety Standards for Boat Gasoline Fuel Systems

This notice proposes regulations which apply to all gasoline-powered inboard boats and boats with permanently installed gasoline-powered auxiliary engines. These proposed regulations do not apply to outboard engines, portable engines, or portable fuel tanks.

The safety standards contained in this proposal are intended to reduce the number of deaths and injuries and the amount of property damage caused by fires and explosions of gasoline on boats. The reason for the exclusion of outboard engines, portable engines, or portable fuel tanks is because a review of 1973 boating statistics published in the 1973 Nationwide Boating Survey showed there was only one fire or explosion of fuel for every 9.9 million exposure hours on outboard boats. On inboard boats there was one fire or explosion of fuel for every 843,000 exposure hours. The statistics also revealed that more than 93% of the fire or explosion of fuel accidents occurred on boats with gasoline engines. Based on these facts, these regulations apply only to inboard boats that have gasoline engines. The Coast Guard has determined that adherence to these proposed minimum safety standards for fuel systems will significantly reduce the probability of release of gasoline liquid and vapor which could otherwise be easily ignited, causing a fire or explosion.

According to proposed § 183.501, the various sections of the proposed regulations will become effective at different times, depending on the nature of the requirement and the amount of time required to comply. Those sections of the proposed regulation that do not require tooling changes and which may only require minor design changes will become effective six months after publication of the final rule. These sections include those requirements that the boat manufacturer can easily comply with and which require parts that are readily available on the market. Other sections because they require the use of components and parts that are not readily available or require other changes that may involve some minor tooling changes by manufacturers will become effective 12 months after publication of the final rule. Certain sections dealing with the design of fuel tanks, hoses, carburetors, and fuel pumps will require major tooling changes. Therefore the longest possible lead time is necessary for manufacturers to comply. These sections will become effective 18 months after publication of the final rule.

The National Boating Safety Advisory Council (NBSAC) has been consulted in meetings open to the public. Its opinion and advice have been considered in the formulation of these proposed regulations.

The NBSAC has given unanimous approval to these proposed regulations. Transcripts of the meetings are available for examination in Room 4310, U.S. Coast Guard Trans Point Building, 2nd and V Streets, S.W., Washington, D.C. The minutes of these meetings are available from the Executive Director, National Boating Safety Advisory Council, c/o Commandant (G-BA/62), U.S. Coast Guard, Washington, D.C.

The Coast Guard has awarded a grant pursuant to §§ 25 and 27(d) of the Federal Boat Safety Act of 1971 (46 U.S.C. 1451) to the American Boat and Yacht Council, Inc. (ABYC). Under the grant, ABYC is preparing a compliance manual for these regulations. The manual will contain explanatory and interpretative information, illustrations, and diagrams to aid manufacturers in complying with the regulations. The manual will not dictate the method a manufacturer must follow to comply with the regulations, but it will be a guide to methods that, if followed, will be acceptable to the Coast Guard as meeting the intent and purpose of the rules. The manual will be distributed by the Coast Guard through the National Technical Information Service and will be available to the public at cost before the Final Rule becomes effective.

The Proposed Fuel System regulations are divided into two groups of sections, Equipment Standards and Manufacturer Requirements, for the convenience of the user. A particular manufacturer may be subject to the requirements of either one or both sections depending on the operation which he performs. The following is a brief explanation of the proposed requirements.

Section 183.510 requires testing of fuel tanks for strength. Before the tank is installed, all sides of the tank are accessible and visible and are therefore, susceptible to tests which use a soap solution on the seams, inert gas detection probes, or other similar tests. A static pressure test is required for each tank prior to installation. This will test the fuel tank's ability to withstand pressure and determines if there are any leaks in the tank. The pressure drop method of detecting the location of the leak is not acceptable because this is not reliable for locating small leaks within a short period of time.

Fuel tanks must also be capable of meeting one of the following structural test requirements: for any tank, a shock test which would determine if the fuel tank will withstand impacts while the boat is in service; for tanks 25 to 99 gallons, a pressure impulse test; for tanks over 99 gallons, a slosh test and a pressure impulse test. These mechanical tests are required to determine if the tank will survive the physical stresses encountered in a boat while underway.

Section 183.512(a) prohibits the use of certain materials for the construction of non-portable fuel tanks. The prohibition in § 183.512(a) exists because of the possibility that trapped moisture will cause corrosion and subsequent fuel leakage. Ternplate and black iron or carbon steel offer insufficient protection from corrosion and their use has resulted in fuel leakage. In addition, organic coatings such as paint or plastic may blister or be scratched or gouged, after which the bare metal would be exposed to corrosion which could cause leaks.

Section 183.514 requires a label with certain information to be affixed to each fuel tank. Section 183.514(b)(5) indicates the manufacturer's statement as to what pressure the tank will test satisfactorily.

Section 183.516 gives specifications for cellular plastics used to encase fuel tanks. The density requirement for polyurethane cellular plastic in paragraph 183.516(d) allows for a standard manufacturing tolerance (i.e., 0.4 pounds per cubic foot) from the density recommended by foam manufacturers for marine structural application. This density and the water absorption requirement in paragraph 183.516(b) prevents corrosion of the tank by water absorbed by the cellular plastic.

Section 183.518 restricts the location of openings in the fuel tank so that a loose fitting would not cause the bilges to be flooded with fuel.

Section 183.520 requires a vent system for fuel tanks. This is necessary because either temperature changes or overfilling can cause destructive pressure rise in the fuel tank. Air trapped in a fuel tank can cause fuel to blow back through the fill opening in some fuel tanks without vents. Also air must be allowed to enter the fuel tank to replace fuel used by the engine.

An accessible flame screen or flame arrestor required by § 183.520(b) must be capable of being cleaned so that it does not lose its capacity for relieving pressure inside the fuel tanks due to corrosion or clogging with debris.

Paragraph 183.524(a) requires that a diaphragm pump will not leak fuel if the diaphragm fails. Most diaphragm fuel pumps used in automotive applications have an external vent which permits fuel to leak out of the pump if the diaphragm is punctured.

Paragraph 183.524(b) enhances safety in case of a carburetor float valve leakage when the engine ignition is inadvertently energized and the engine is not operating. In such an instance fuel would be pumped into the engine intake manifold from which it could vaporize into the engine compartment.

Section 183.526 inhibit's fuel leakage from flooded or overflowing carburetors. Five cubic centimeters of fuel seepage is allowed per paragraph 183.526(b). The amount allowed is sufficiently small so the fuel vapor mixture within the engine compartment does not reach the explosive range.

Paragraph 183.526(c) requires updraft and horizontal carburetors to be equipped with drip collectors having a return line to dispose of leaking fuel safely, by causing it to be drawn into the engine intake manifold. The intent of this paragraph is to prevent excess fuel from flowing into the engine room.

Paragraph 183.528(a) requires that electrically operated valves be installed so that they open only when the boat's ignition is on. These valves must also be

capable of being operated manually. These valve specifications will enable boat operators to shut off fuel in emergency situations and for routine maintenance.

Section 183.536 specifies that gaskets and seals must form an unsplit ring and specifies a test to insure that they will not leak fuel. The fuel specified for the test has 50 percent aromatic content. This is required in order to provide realistic testing of many synthetic rubber compounds because some fuels used in boats have very high aromatic content which causes deterioration of gaskets and seals.

Section 183.538 specifies material and a minimum wall thickness for distribution lines in the fuel system. Paragraph 183.538(a) excludes that section of the fuel feed line mounted on the engine which is between the fuel pump and carburetor. This section of the fuel feed line may be either USCG Type "A" hose or steel tubing or one of the copper alloys listed in § 183.538. The heat of the engine and the oily conditions which exist will protect steel tubing from corrosion. Steel tubing is not permitted to be used for any of the other fuel lines in the boat.

Section 183.550(c) prohibits fuel tanks from providing structural support for decking, bulkheads, or other components of the boat structure. Bulkheads and decking are not considered to be structurally supported by the fuel tank if they can continue to perform their normal function after removing the fuel tank which was in incidental contact with the bulkheads or decking. Protective covers or panels which are not part of the boat structure are not included in this prohibition.

Paragraph 183.550(f) provides that cellular plastic cannot be used to support a metallic fuel tank. Even though the cellular plastic might be structurally adequate to support a metallic fuel tank, the high stresses developed between the metal and the cellular plastic can cause separation of the cellular plastic from the metal and permit moisture to be trapped, causing corrosion of the fuel tank.

Section 183.552 allows fuel tanks to be encased in plastic with certain restrictions regarding installation. Improper encasement in plastic can result in a safety hazard due to corrosion. The section has special requirements for metallic tanks encased in plastic because of the possibility of the corrosion of the metal. The adhesion requirement in paragraph 183.552(c) provides protection against corrosion resulting from water trapped against the tank's surface.

Section 183.554 sets forth accessibility requirements for the fuel system components. These requirements enable the operator to prevent or repair fuel leaks caused by loose fittings, joints, and connections. Also, the static pressure test required by § 183.582 can be performed more easily when the fittings are accessible.

Paragraph 183.556(a) prohibits the installation of fittings for the purpose of draining fuel from the tank or line. Investigations have shown that several fires and explosions have occurred when fuel drainage fittings were inadvertently left open or vibrated open while the boat was underway. Paragraph 183.556(b) is an exception to the general prohibition of drain plugs set forth in paragraph 183.556(a). A plug that is not readily removable and will not leak or vibrate open, may be installed for the purpose of servicing filters and strainers.

Section 183.558 specifies hose types used for vent, fill, and distribution lines. The performance requirements for USCG Type "A" and USCG Type "B" hose are similar except that Type "A" hose must pass the 2½ minute fire test without leaking. Type "A" hose must be used when more than 5 ounces of fuel is discharged in 2½ minutes if the hose were severed at any point. Type "B" hose is permitted to be used if five ounces or less fuel would be released due to failure of the hose. The addition of five ounces or less fuel to a fire which is already burning with sufficient intensity to destroy the hose would not add significantly to the danger.

Paragraph 183.558(d) specifies fit tolerances for the mating of hoses and spuds, pipes, or hose fittings in order to prevent loosening of the connections or leaks.

Paragraph 183.560(d) requires that hose used with hose clamps be a type which is designed for use with clamps because some wire reinforced hose cannot be clamped securely. Paragraph 183.560 (d) prohibits the use of spring clamps because these clamps weaken and lose tension with the passage of time and cannot be tightened.

Section 183.562(a) requires a flexible section in the fuel line where it passes from a rigid connection on the hull to an engine which may flex and vibrate. This prevents loosening of fittings and cracking of metallic fuel lines. A loop or coil of rigid tubing is not acceptable for this purpose because the metal used might harden and crack under vibration. Section 183.562(b) requires the rigid fuel line which is attached to the boat structure to be clamped within four inches of the connection to the flexible fuel line to minimize transmission of vibration and stress from the flexible line to the rigid line.

Section 183.564(a) requires the deck fill fitting for the fuel system to be located or arranged so that fuel which accidentally overflows during fueling will not flow into the boat. Section 183.564 (b)(3) requires two hose clamps to be used on each end of a fill hose which is clamped so that the relatively stiff construction of the fill hose will not cause the hose to slide off the fitting or twist into a position which would cause a leak.

The location requirement of § 183.566 for a fuel pump limits the length of fuel line which is under pressure for minimum chance of rupture.

Section 183.568 requires either a system design or an automatic valve in the fuel line from each fuel tank that will prevent accidental siphoning of fuel from the tank and eliminate the hazard of a parted fuel line draining the fuel tank.

Section 183.570 specifies that fuel filters and strainers must be mounted independently on the engine or boat structure to reduce failure of fuel line connections due to vibration.

The grounding requirements of § 183.572 prevents harmful accumulations of static electric charge which could be a source of ignition of fuel or fuel vapor. Only the fuel fill system metallic components and metal parts of the fuel tank which are in contact with the fuel are required to be grounded because static electricity is generated in a fuel system only where high flow velocities and air are present.

After the entire fuel system has been installed, it must be pressure tested under the conditions proposed in § 183.582. This testing requirement is in addition to the pre-installation testing of the fuel tank required by § 183.510. Because much of the fuel tank will be inaccessible after installation, the pressure drop method is allowed to test for tank leakage. All fittings, joints, and connections of the fuel system must be tested for leakage by a method other than the pressure drop method, because it will often fail to detect a small leak in a joint or fuel line fitting.

Paragraphs 183.584(b), 183.586(b), and 183.588(c) require nonmetallic fuel tanks to be preconditioned with fuel for 30 days prior to mechanical testing in order to detect any attack on the fuel tank material by high aromatic content fuels.

Section 183.584 sets forth requirements for shock testing of fuel tanks. Tanks located forward of the half length of a boat are exposed to higher vertical accelerations and are therefore tested to a level of 25 times the acceleration of gravity (25 g) while tanks located in the after half of the boat are tested to 15 g.

Larger fuel tanks require a longer time to be fully extended by the internal pressure of the fuel when subjected to a vertical shock. For that reason, fuel tanks of 25 or more gallons capacity are tested with a vertical shock duration of 35 to 45 milliseconds while tanks of less than 25 gallons capacity are tested to a duration of 6 to 14 milli-seconds.

Section 183.586 sets forth the requirements for pressure impulse testing of fuel tanks of 25 or more gallons capacity. This simulates the effects of the weight of fuel acting on the inside of the fuel tank while the boat is running in a seaway.

Section 183.588 sets for the requirements for a slosh test for fuel tanks of 100 or more gallons capacity. This test simulates the effects of fuel surging against the baffles and end plates when a boat is in a seaway.

Section 183.590 sets forth requirements for a fire test of fuel system components which exposes the test item to open flame from burning heptane for 2½ minutes. Heptane will be used by the Coast Guard for compliance testing because it has more uniform burning characteristics than the gasoline sold in various parts of the country.

Items being tested as installed on an engine or in a boat are permitted to take advantage of the protection to be derived from the structure of the boat or engine.

The Coast Guard is proposing that the time limit of the fire test be 2½ minutes because the Motorboat Committee of the National Fire Protection Association considers that a minimum of 2½ minutes should be allowed for the boat operator to attempt to extinguish the fire with a portable extinguisher before any major leakage of fuel could be caused by the fire.

The standards and codes referenced in these regulations have been approved for incorporation by reference by the Director of the Federal Register and they are on file in the Federal Register Library.

Any interested person may submit written data, views, or arguments concerning this notice to the Executive Secretary, Marine Safety Council, U.S. Coast Guard, Room 8117, 400 7th Street, SW., Washington, D.C. 20590. All communications received before December 1, 1976, will be considered before the final rule is published.

Each person submitting comments should include his name and address, identify this notice (CGD 74–209) and give reasons and supporting data for any recommendations. All comments will be available for examination in Room 8117, Coast Guard Headquarters, 400 7th Street, SW., Washington, D.C. 20590. No hearing is contemplated but may be held at a time and place set in a later notice in the FEDERAL REGISTER, if requested by an interested person desiring an opportunity to comment orally at a public hearing and raising a genuine issue.

The economic and inflationary impacts, and the evaluation of benefits of these proposed regulations have been carefully evaluated in accordance with Office of Management and Budget Circular A–107. The proposed regulations should result in a cost to industry of approximately $2.75 million to $9.35 million per year. These industry costs should result in an increased cost to the consumer of .16 percent to 3.3 percent, depending on the size of the boat purchased. The benefit of the proposed regulations is the reductions in the amount of property damage, the number of injuries, and the number of lives lost. No Inflationary Impact Statement is required.

In consideration of the foregoing, it is proposed to amend Part 183 of Chapter 1 of Title 33 of the Code of Federal Regulations by adding a new Subpart J to follow Subpart I and to read as follows:

Subpart J—Fuel Systems

Subpart J—Fuel Systems

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AUTHORITY: 46 U.S.C. 1454; 49 CFR 1.46 (n)(1).

Subpart J—Fuel Systems

GENERAL

§ 183.501 Applicability.

(a) This subpart applies to all boats that have gasoline engines, except outboard engines, for electrical or mechanical power for propulsion.

(b) The sections in this subpart are effective on the following dates:

(SIX MONTHS AFTER PUBLICATION OF THE FINAL RULE)

183.501	183.562
183.505	183.566
183.507	183.568
183.518	183.572
183.520	183.580
183.528	183.582
183.534	183.584
183.536	183.586
183.538	183.588
183.542	183.590
183.556	

(12 MONTHS AFTER PUBLICATION OF THE FINAL RULE)

183.510	183.550
183.514	183.554
183.522	183.560
183.530	183.564
183.532	183.570

(18 MONTHS AFTER PUBLICATION OF THE FINAL RULE)

183.512	183.540
183.516	183.552
183.524	183.558
183.526	

§ 183.505 Definitions.

As used in this subpart—

"ASTM" means American Society for Testing and Materials. ASTM standards in this subpart may be examined at Coast Guard Headquarters, Room 4314, Trans Point Building, 2100 2nd St., S.W., Washington, D.C. 20590 and may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

"Flame arrestor" means a device or assembly that prevents passage of flame through a fuel vent.

"Fuel system" means the entire assembly of the fuel fill, vent, tank, and distribution components, including pumps, valves, strainers, carburetors, and filters.

"SAE" means Society of Automotive Engineers, Inc. SAE standards in this subpart may be examined at Coast Guard Headquarters, Room 4314, Trans Point Building, 2100 2nd St., S.W., Washington, D.C. 20590 and may be obtained from the Society of Automotive Engineers, Inc., 400 Commonwealth Dr., Warrendale, PA 15096.

"Static floating position" means the attitude in which a boat floats in calm water, with each fuel tank filled to its rated capacity, but with no person or item of portable equipment on board.

"UL" means Underwriters' Laboratories, Inc. UL standards in this subpart may be examined at Coast Guard Headquarters, Room 4314, Trans Point Building, 2100 2nd St., S.W., Washington, D.C. 20590 and may be obtained from Underwriters' Laboratories, Inc., 207 East Ohio Street, Chicago, IL, 60611.

"USCG Type A Hose" means hose that meets the requirements of—

(1) SAE Standard J30B, dated August, 1973, and the requirements of § 183.590; or

(2) UL Standard 1114 dated September 15, 1976.

"USCG Type B Hose" means hose that meets the requirements of SAE Standard J30B, dated August, 1973.

§ 183.507 General.

Each fuel system component on a boat to which this subpart applies must meet the requirements of this subpart unless the component is part of an outboard engine or is part of portable equipment.

EQUIPMENT STANDARDS

§ 183.510 Fuel tanks.

(a) Each fuel tank in a boat must have been tested by its manufacturer under § 183.580 and not leak.

(b) Each fuel tank must not leak if subjected to the fire test under § 183.590. Leakage is determined by the static pressure test under § 183.580, except that the test pressure must be at least one-fourth PSIG.

(c) Each fuel tank of less than 25 gallons capacity must not leak if tested under § 183.584.

(d) Each fuel tank with a capacity of 25 to 99 gallons must not leak if tested—

(1) Under § 183.584; or

(2) § 183.586.

(e) Each fuel tank of 100 gallons capacity or more must not leak if tested—
(1) Under § 183.584; or
(2) §§ 183.586 and 183.588.

§ 183.512 Fuel tanks: prohibited materials.

(a) A fuel tank must not be constructed from terneplate.
(b) Unless it has an inorganic sacrificial galvanic coating on the inside and outside of the tank, a fuel tank must not be constructed from black iron or carbon steel.
(c) A fuel tank encased in cellular plastic or in fiber reinforced plastic must not be constructed from a ferrous alloy.

§ 183.514 Fuel tanks: labels.

(a) Each fuel tank must have a label that meets the requirements of paragraphs (b) through (d) of this section.
(b) Each label required by paragraph (a) of this section must contain the following information:
(1) Fuel tank manufacturer's name (or logo) and address.
(2) Month (or lot number) and year of manufacture.
(3) Capacity in U.S. gallons.
(4) Material of construction.
(5) The pressure the tank is designed to withstand without leaking.
(6) Shock test classification in "g's", if applicable.
(7) Model number, if applicable.
(8) The statement, "This tank has been tested under 33 CFR 183.580."
(9) If the tank is tested under § 183.584 at less than 25g vertical accelerations the statement, "Must be installed aft of the boat's half length."
(c) Each letter and each number on a label must—
(1) Be at least $\frac{1}{16}$ inch high and
(2) Contrast with the basic color of the label or be embossed on the label.
(d) Each label must—
(1) Withstand the combined effects of exposure to water, oil, salt spray, direct sun light, heat, cold, and wear expected in normal operation of the boat, without loss of legibility; and
(2) Resist efforts to remove or alter the information on the label without leaving some obvious sign of such efforts.

§ 183.516 Cellular plastic used to encase fuel tanks.

Cellular plastic used to encase metallic fuel tanks must—
(a) Have compressive strength of at least 60 pounds per square inch at five percent deflection measured under ASTM D–1621, "Compressive Strength of Rigid Cellular Plastics," dated August 31, 1964;
(b) Not absorb more than one-half percent water by volume measured under ASTM C–272, "Water Absorption of Core Materials for Structural Sandwich Constructions," dated September 15, 1963;
(c) Not change volume by more than five percent or dissolve after being immersed in any of the following liquids for 24 hours at 29° C:
(1) Reference fuel B ASTM D–471, dated December 18, 1968.
(2) No. 2 reference oil of ASTM D–471, dated December 18, 1968.
(3) Five percent solution of trisodium phosphate in water; and
(d) If the material is polyurethane cellular plastic, have a density of at least 3.6 pounds per cubic foot measured under ASTM D–1622, "Apparent Density of Rigid Cellular Plastics," dated September 30, 1963.

§ 183.518 Fuel tank openings.

Each opening into the fuel tank must be at or above the topmost surface of the tank.

§ 183.520 Fuel tank vents.

(a) Each fuel tank must have a vent that prevents pressure in the tank from exceeding 80 percent of the pressure marked on the tank label under § 183.514 (b)(5).
(b) Each vent must—
(1) Have a flame arrester that can be cleaned unless the vent is itself a flame arrestor; and
(2) Not allow a fuel overflow at the rate of up to two gallons per minute to enter the boat.

§ 183.522 Fuel tank fill fitting.

Fuel must not blow back through the fuel fill fitting when a tank is—
(a) Between one-fourth and three-fourths full; and
(b) Refueled at a rate of at least nine gallons per minute.

§ 183.524 Fuel pumps.

(a) Each diaphragm pump must not leak fuel from the pump if the primary diaphragm fails.
(b) Each electrically operated fuel pump must not operate except when the engine is operating or when the engine is started.
(c) If tested under § 183.590, a fuel pump must not leak fuel.

§ 183.526 Carburetors.

(a) If tested under § 183.590, a carburetor must not leak fuel.
(b) Each carburetor must not leak more than five cubic centimeters of fuel in 30 seconds when—
(1) The float valve is open;
(2) The carburetor is at half throttle; and
(3) The engine is cranked without starting; or
(4) The fuel pump is delivering the maximum pressure specified by its manufacturer.
(c) Each updraft and horizonal draft carburetor must have a device that—
(1) Collects and holds fuel that flows out of the carburetor venturi section toward the air intake;
(2) Prevents collected fuel from being carried out of the carburetor assembly by the shock wave of a backfire or by reverse air flow; and
(3) Returns collected fuel to the engine induction system after the engine starts.

§ 183.528 Fuel stop valves.

(a) Each electrically operated fuel stop valve in a fuel line between the fuel tank and the engine must—
(1) Open electrically only when the ignition switch is on; and
(2) Operate manually.
(b) If tested under § 183.590, a fuel stop valve must not leak fuel.

§ 183.530 Spud, pipe, and hose fitting configuration.

Except when used for a tank fill line, each spud, pipe, or hose fitting used with hose clamps must have—
(a) A bead;
(b) A flare; or
(c) A series of annualar grooves or serrations no less than 0.015 inches deep, except a continuous helical thread, knurl, or groove.

§ 183.532 Clips, straps, and hose clamps.

(a) Each clip, strap, and hose clamp must—
(1) Be made from a corrosion resistant material; and
(2) Not cut or abrade the fuel line.
(b) When tested under § 183.590, a clip, strap, or hose clamp must not separate under a one pound tensile force.
(c) The minimum band width of a hose clamp is determined under Table 7 by the outside diameter of the hose.

TABLE 7

Outside hose diameter (inches):	*Minimum clamp band width (inches)*
Less than $\frac{7}{16}$	$\frac{1}{4}$
$\frac{7}{16}$ to $\frac{9}{16}$	$\frac{5}{16}$
Greater than $\frac{9}{16}$ to $1\frac{3}{8}$	$\frac{3}{8}$
Greater than $1\frac{3}{8}$	$\frac{1}{2}$

§ 183.534 Fuel filters and strainers.

When tested under § 183.590, each fuel filter and strainer must not leak fuel from the filter, strainer, or its connections.

§ 183.536 Seals and gaskets in fuel filters and strainers.

(a) Each gasket and seal used in a fuel filter and strainer must form an unsplit ring.
(b) Each gasket and each sealed joint in a fuel filter and strainer must not leak when subjected for 24 hours to a gasoline that has at least a 50 percent aromatic content at the test pressure determined under § 183.582(a).

§ 183.538 Fuel line materials.

Each metallic fuel line connecting the fuel tank with the fuel inlet connection on the engine must—
(a) be made of seamless annealed copper, nickel copper, or copper-nickel; and
(b) except for corrugated flexible fuel line, have a minimum wall thickness of 0.029 inches.

§ 183.540 Hoses: identification.

(a) Each "USCG Type A" hose and each "USCG Type B" hose must be identified by the manufacturer by a marking on the hose itself. If the complete text of the marking is not on a section of hose,

the boat manufacturer must attach a tag that meets the requirements of paragraphs (b) and (c) of this section.

(b) Each marking and tag must contain the following information in English:

(1) The statement "USCG TYPE (insert A or B) HOSE."

(2) The year in which the hose was manufactured.

(3) The manufacturer's name or registered trademark.

(c) Each character must be block capital letters and numerals that are at least one-eighth inch high.

(d) Each marking must be permanent, legible, and on the outside of the hose at no less than 12 inch intervals.

§ 183.542 Fuel systems.

Each fuel system in a boat must have been tested under § 183.582 by the boat manufacturer and not leak.

MANUFACTURER REQUIREMENTS

§ 183.550 Fuel tanks: installation.

(a) Each fuel tank must not be integral with any boat structure or mounted on an engine.

(b) Each tank must not move at the mounting surface more than one-fourth inch in any direction.

(c) Each fuel tank must not support a deck, bulkhead, or other structural component.

(d) Water must drain from the surface of each metallic fuel tank when the boat is in its static floating position.

(e) Each tank support, chock, or strap that is not integral with a metallic fuel tank must be insulated from the tank surface by a nonmoisture absorbing material.

(f) Cellular plastic must not be the sole support for a metallic fuel tank.

(g) If cellular plastic is the sole support of a non-metallic fuel tank, the cellular plastic must meet the requirements of § 183.516(a) and (d).

(h) Each fuel tank labeled under § 183.514(b)(9) for installation aft of the boat's half length must be aft of the boat's half length.

§ 183.552 Plastic encased fuel tanks: installation.

(a) Each fuel tank encased in cellular plastic foam or in fiber reinforced plastic must have the connections, fittings, and labels accessible for inspection and maintenance.

(b) If a metallic fuel tank is encased in cellular plastic or in fiber reinforced plastic, water must not collect between the plastic and the surface of the tank or be held against the tank by capillary action.

(c) If the plastic is bonded to the surface of a metallic tank, the adhesive strength of the metal to the plastic bond must exceed the cohesive strength of the plastic.

§ 183.554 Fittings, joints, and connections.

Each fuel system fitting, joint, and connection must be arranged so that it can be reached for inspection, removal, or maintenance without removal of permanent boat structure.

§ 183.556 Plugs and fittings.

(a) A fuel system must not have a fitting for draining fuel.

(b) A plug used to service the fuel filter or strainer must have a tapered pipe-thread or be a screw type fitted with a locking device other than a split lock washer.

§ 183.558 Hoses and connections.

(a) Each hose between the fuel pump and the carburetor must be "USCG Type A" hose.

(b) Each hose used for a vent line or fill line and each hose from the fuel tank to the fuel inlet connection on the engine must be—

(1) "USCG Type A" hose; or

(2) "USCG Type A" or "USCG Type B" hose, if no more than five ounces of fuel is discharged in 2½ minutes when—

(i) The hose is severed at the point where maximum drainage of fuel would occur.

(ii) The boat is in its static floating position, and

(iii) The fuel system is filled to the capacity marked on the tank label under § 183.514(b)(5).

(c) Each hose must be secured by—

(1) A swaged sleeve;

(2) A sleeve and threaded insert; or

(3) A hose clamp.

(d) The inside diameter of a hose must not exceed the actual minor outside diameter of the connecting spud, pipe, or fitting by more than the distance shown in Table 8.

TABLE 8

If minor outside diameter of the connecting spud, pipe, or fitting is—	The inside diameter of the hose must not exceed the minor outside diameter of the connecting spud, pipe, or hose fitting by more than the following distance:
Less than ⅜ in	0.29 in.
⅜ in to 1 in	0.035 in.
Greater than 1 in	0.065 in.

§ 183.560 Hose clamps: installation.

Each hose clamp on a hose from the fuel tank to the fuel inlet connection on the engine, a hose between the fuel pump and the carburetor, or a vent line must—

(a) Be used with hose designed for clamps;

(b) Be at least one clamp width from the hose end;

(c) Be beyond the bead, flare, or over the serrations of the mating spud, pipe, or hose fitting; and

(d) Not depend solely on the spring tension of the clamp for compressive force.

§ 183.562 Metallic fuel lines.

(a) Each metallic fuel line that is mounted to the boat structure must be connected to the engine by a flexible fuel line.

(b) Each metallic fuel line must be attached to the boat's structure within four inches of its connection to a flexible fuel line.

§ 183.564 Fuel tank fill system.

(a) Each fuel fill opening must be located so that a gasoline overflow of up to five gallons per minute will not enter the boat when the boat is in its static floating position.

(b) Each hose in the tank fill system must be secured to a pipe, spud, or hose fitting by—

(1) A swaged sleeve;

(2) A sleeve and threaded insert; or

(3) Two adjacent metallic hose clamps that do not depend solely on the spring tension of the clamps for compressive force.

(c) Each hose clamp in the tank fill system must be used with a hose designed for clamps.

(d) Hose clamps used in the tank fill system must—

(1) Have a minimum band width of at least one-half inch; and

(2) Be over the hose and the spud, pipe, or hose fitting and not less than one-half inch from the end of the hose.

§ 183.566 Fuel pumps: placement.

Each fuel pump must be on the engine it serves or within 12 inches of the engine, unless it is a fuel pump used to transfer fuel between tanks.

§ 183.568 Anti-siphon protection.

Each fuel line from the fuel tank to the fuel inlet connection on the carburetor must—

(a) Be above the level of the tank top;

(b) Have an anti-siphon device at the tank withdrawal fitting; or

(c) Have an electrically operated fuel stop valve at the tank withdrawal fitting.

§ 183.570 Fuel filters and strainers: installation.

Each fuel filter and strainer must be supported on the engine or boat structure independent from its fuel line connections, unless the fuel filter or strainer is inside a fuel tank.

§ 183.572 Grounding.

Each metallic component of the fuel fill system and fuel tank which is in contact with fuel must be statically grounded so that the resistance between the ground and each metallic component of the fuel fill system and fuel tank is less than 100 ohms.

TESTS

§ 183.580 Static pressure test for fuel tanks.

A fuel tank is tested by performing the following procedures in the following order:

(a) Fill the tank with air or inert gas to the pressures marked on the tank label under § 183.514(b)(5). The pressure is measured by a calibrated pressure gauge with a pressure range not exceeding three times the test pressure required by this paragraph or by a manometer.

(b) Examine each tank fitting and seam for leaks using a leak detection method other than the pressure drop method.

§ 183.582 Static pressure test for fuel systems.

A fuel system is tested by performing the following procedures in the following order:

(a) Fill the system with air or inert gas to the greater of the following pressures:

(1) Three PSIG.

(2) One and one-half times the pressure created at the lowest point in the fuel system when the fill or vent line, whichever is lower in height, is filled to its top with fuel.

(b) Read the pressure. The pressure is measured by a calibrated pressure gauge with a pressure range not exceeding three times the test pressure required by this paragraph or by a manometer.

(c) Wait at least five minutes and thereafter wait one additional minute for each 10 gallon increment, or fraction thereof, in the tank's capacity greater than 50 gallons.

(d) Read the pressure in accordance with paragraph (b) of this section. A pressure drop measured at the end of the time required by paragraph (c) of this section is due to leakage.

(e) If no pressure drop is measured by the manometer or pressure gauge, then while the system remains pressurized, examine each fuel fitting, joint, and connection for leaks, using a leak detection method other than the pressure drop method.

§ 183.584 Shock test.

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under § 183.580.

(b) If the tank is non-metallic, fill it to capacity with a gasoline that has at least a 50 percent aromatic content. Keep the fuel in the tank at 21° C or higher for 30 days prior to testing.

(c) Mount the tank to the platform of an impact test machine.

(d) Fill the tank to capacity with water.

(e) Cap and seal each opening in the tank.

(f) Apply one of the following accelerations within three inches of the center of the horizontal mounting surface of the tank. The duration of each vertical acceleration pulse is measured at the base of the shock envelope. Each vertical acceleration pulse must approximate a half sine wave.

(1) If the tank is not labeled under § 183.514(b)(9) for installation aft of the half length of the boat, apply 1000 cycles of 25g vertical accelerations at a rate of 80 cycles or less per minute. The duration of the acceleration pulse must be between six and 14 milliseconds for tanks of less than 25 gallons capacity and between 35 and 45 milliseconds for tanks of 25 or more gallons capacity.

(2) If the tank is manufactured for installation with its center of gravity aft of the half length of the boat, apply 1000 cycles of 15g vertical accelerations at a rate of 80 cycles or less per minute. The duration of the shock pulse must be between six and 14 milliseconds for tanks of less than 25 gallons capacity and between 35 and 45 milliseconds for tanks of 25 or more gallons capacity.

(h) Perform the static pressure test under § 183.580.

§ 183.586 Pressure impulse test.

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under § 183.580.

(b) If the tank is non-metallic, fill it to capacity with a gasoline that has at least a 50 percent aromatic content. Keep the fuel in the tank at 21° C or higher for 30 days prior to testing.

(c) Mount the tank on a test platform.

(d) Fill the tank to capacity with water.

(e) Cap and seal each opening in the tank.

(f) Apply 25,000 cycles of pressure impulse at the rate of no more than 15 impulses per minute varying from zero to three PSIG to zero inside the tank top from a regulated source of air, inert gas, or water.

(g) Perform the static pressure test under § 183.580.

§ 183.588 Slosh test.

A fuel tank is tested by performing the following procedures in the following order:

(a) Perform the static pressure test under § 183.580.

(b) Perform the pressure impulse test under § 183.586.

(c) If the tank is non-metallic, fill it to capacity with a gasoline that has at least a 50 percent aromatic content. Keep the fuel in the tank at 21° C or higher for 30 days prior to testing.

(d) Secure the tank to the platform of a tank rocker assembly.

(e) Fill the tank to one-half capacity with water.

(f) Cap and seal each opening in the tank.

(g) Apply 500,000 cycles of rocking motion 15 degrees to each side of the tank centerline at the rate of 15 to 20 cycles a minute. The axis of rotation of the rocker and fuel tank must be perpendicular to the centerline of the tank length at a level six inches or less above or below the tank's bottom.

(h) Perform the static pressure test under § 183.580.

§ 183.590 Fire test.

(a) A piece of equipment is tested under the following conditions and procedures:

(1) Fuel stop valves, "USCG Type A" hoses, clips, straps, and hose clamps are tested in a fire chamber.

(2) Fuel filters, strainers, pumps, and carburetors are tested in a fire chamber or as installed on the engine.

(3) Fuel tanks must be tested filled with fuel to one-fourth the capacity marked on the tank in a fire chamber or in an actual or simulated hull section.

(b) Each fire test is conducted with free burning heptane and the component must be subjected to a flame for 2½ minutes.

(c) If the component is tested in a fire chamber—

(1) The temperature within one inch of the component must be at least 648°C sometime during the 2½ minute test;

(2) The surface of the heptane must be eight to 10 inches below the component being tested; and

(3) The heptane must be in a container that is large enough to permit the perimeter of the top surface of the heptane to extend beyond the vertical projection of the perimeter of the component being tested.

(d) If the component is being tested as installed on an engine, heptane sufficient to burn 2½ minutes must be poured over the component and allowed to run into a flat bottomed pan under the engine. The pan must be large enough to permit the perimeter of the top surface of the heptane to extend beyond the vertical projection of the perimeter of the engine.

(e) If a fuel tank is being tested in an actual or simulated hull section, the actual or simulated hull section must be of sufficient size to contain enough heptane to burn for 2½ minutes in a place adjacent to the tank.

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